Adapting to Stress: Lessons from the Resilient

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Researchers

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- Douglas C. Johnson
- Meena Vythilingham

- Charles A. Morgan
- Robert Pietrzak
- Paul Morrissey
- Dennis S. Charney
- Douglas Bremner

Stress Response

- The body has a remarkably similar neurobiological response to a broad array of stressors (Sympathetic Nervous System and the Hypothalamic-Pituitary Adrenal Axis)
- The Stress Response is life saving but if it continues for too long it can cause health problems (e.g. cardiovascular system, immune system, nervous system, psychological)
- In some cases our own Stress Response can become more damaging than the stressor itself

Damage from Stress Response most likely when

- a. Stress is unremitting (prolonged trauma, chronic wear and tear, moral injury, etc.
- b. Inability to adjust to stress
- c. Inability to shut off the Stress Response

MEDIAL PFC & Ant Cingulate

Bremner 99

Bremner 99 stroop)

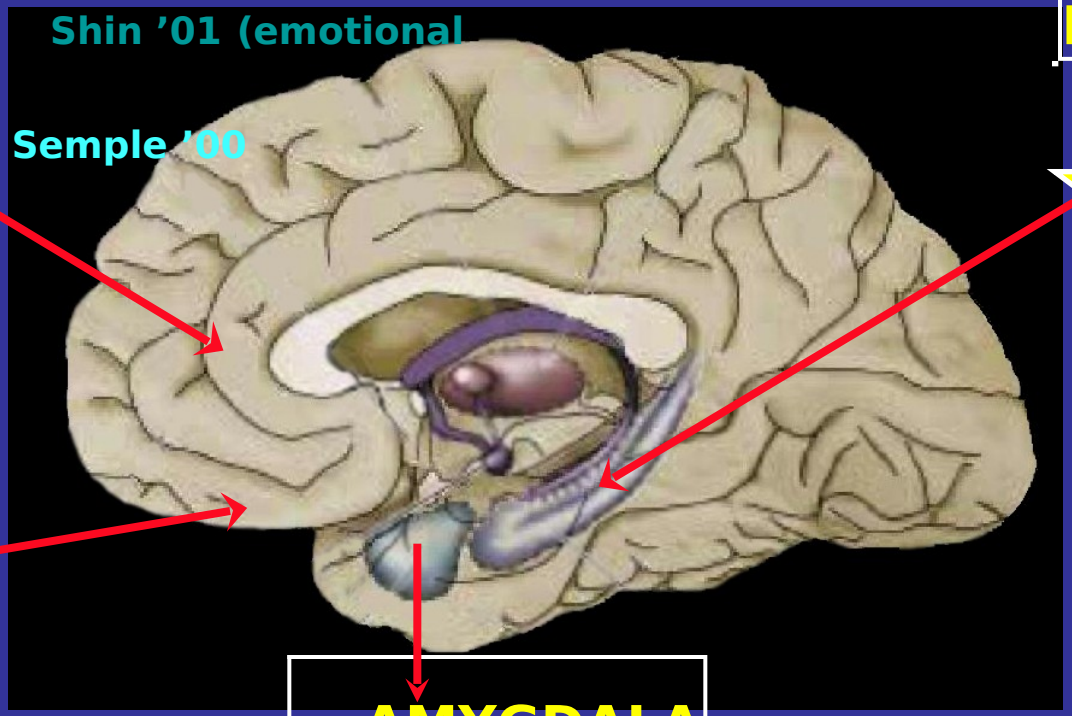
Shin 97

Shin 99

Lanius ’00 (scripts)

Shin ’01 (emotional

Semple ’00



HIPPOCAMPUS

Bremner 99

OFC

Semple 93

Shin 99

Rauch 96

AMYGDALA

Rauch 96 (combat scripts)

Liberzon 99(combat sounds) scripts)

Shin 97 (CSA scripts) slides

Rauch ‘00 (masked faces)

Semple ’00 (auditory CPT)

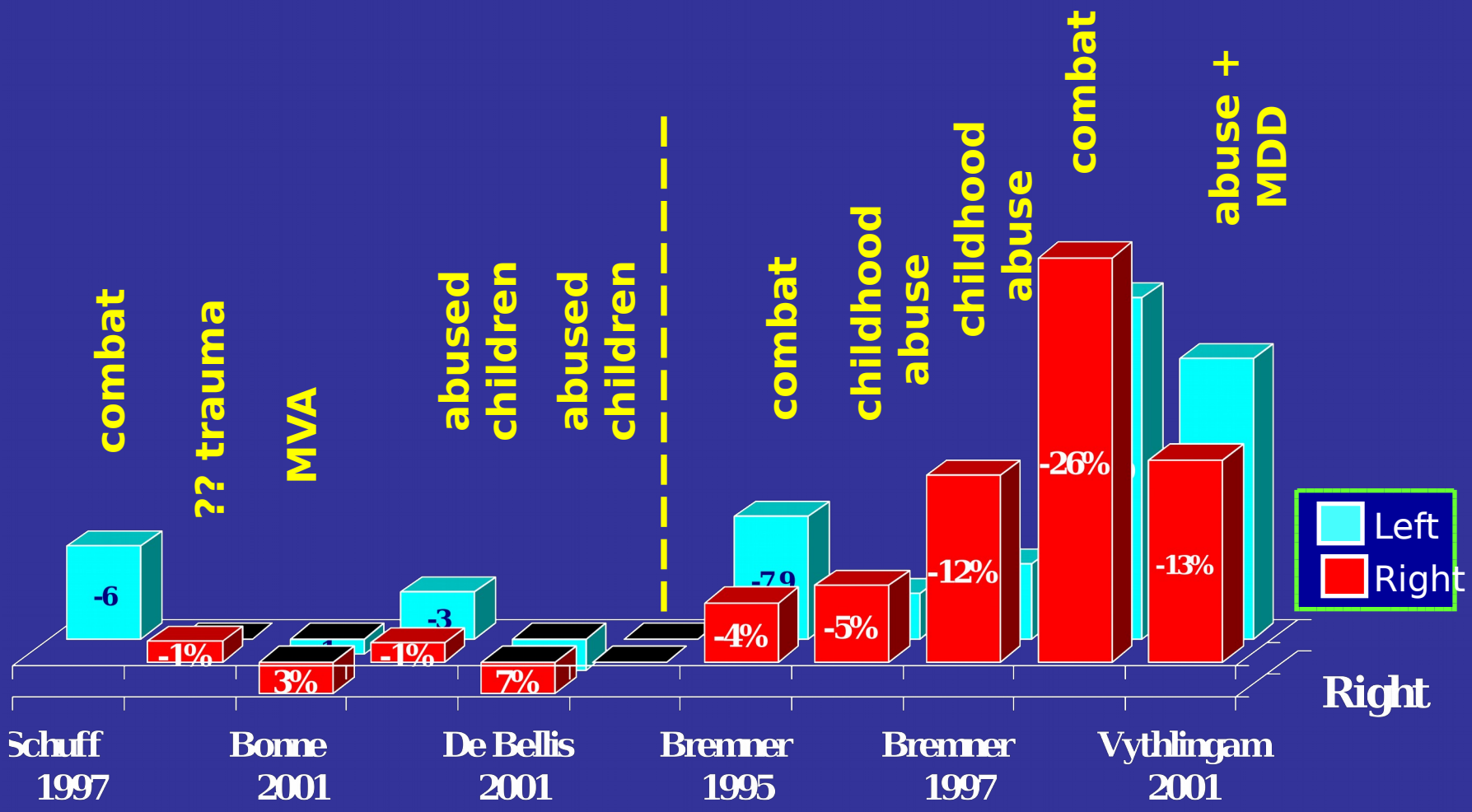
Shin 99 (CSA scripts)

Bremner 99 (CSA

Bremner 99 (combat & sounds)

HIPPOCAMPAL VOLUME IN PTSD

(% DIFFERENCE BETWEEN PTS AND Controls)



Vythilingam 2001 (unpublished)

Sensitization

Sensitization refers to increased behavioral, physiological and/or biochemical responses to stressors.

Increased synthesis and increased release of neurotransmitters in response to subsequent stress. (e.g. adrenaline)

Evidence of Altered Catecholamine Activity

1. **Elevated 24-hour excretion of epinephrine and norepinephrine**
2. **Elevated 24-hour plasma samples of norepinephrine.**
3. **Decreased platelet alpha 2 adrenergic receptor number.**
4. **Exaggerated behavioral, physiological and biochemical responses to yohimbine.**
5. **Altered brain metabolism in response to yohimbine.**
6. **Symptomatic response to adrenergic blockers. (e.g. clonidine, propranolol).**

Potential Symptoms of Sensitization

- Hyper-vigilance
- Exaggerated startle response
- Difficulty sleeping
- Irritability
- Impulsivity and anger
- Intrusive memories of trauma

Consequences of Stress

When stress is uncontrollable and overwhelming and chronic it can be destructive and cause or exacerbate:

1. Burnout
2. Posttraumatic Stress Disorder
3. Physical disorders (e.g. cardiac disorders)

When stress is manageable it is positive and leads to growth and enhanced competence

Definition of Resilience

American Psychological Association:

“The process of adapting well in the face of adversity, trauma, tragedy, threats or even significant sources of stress.”

After a two year loan to the United States ,
Michelangelo's David is being returned to Italy.

Multidimensional Nature of Resilience

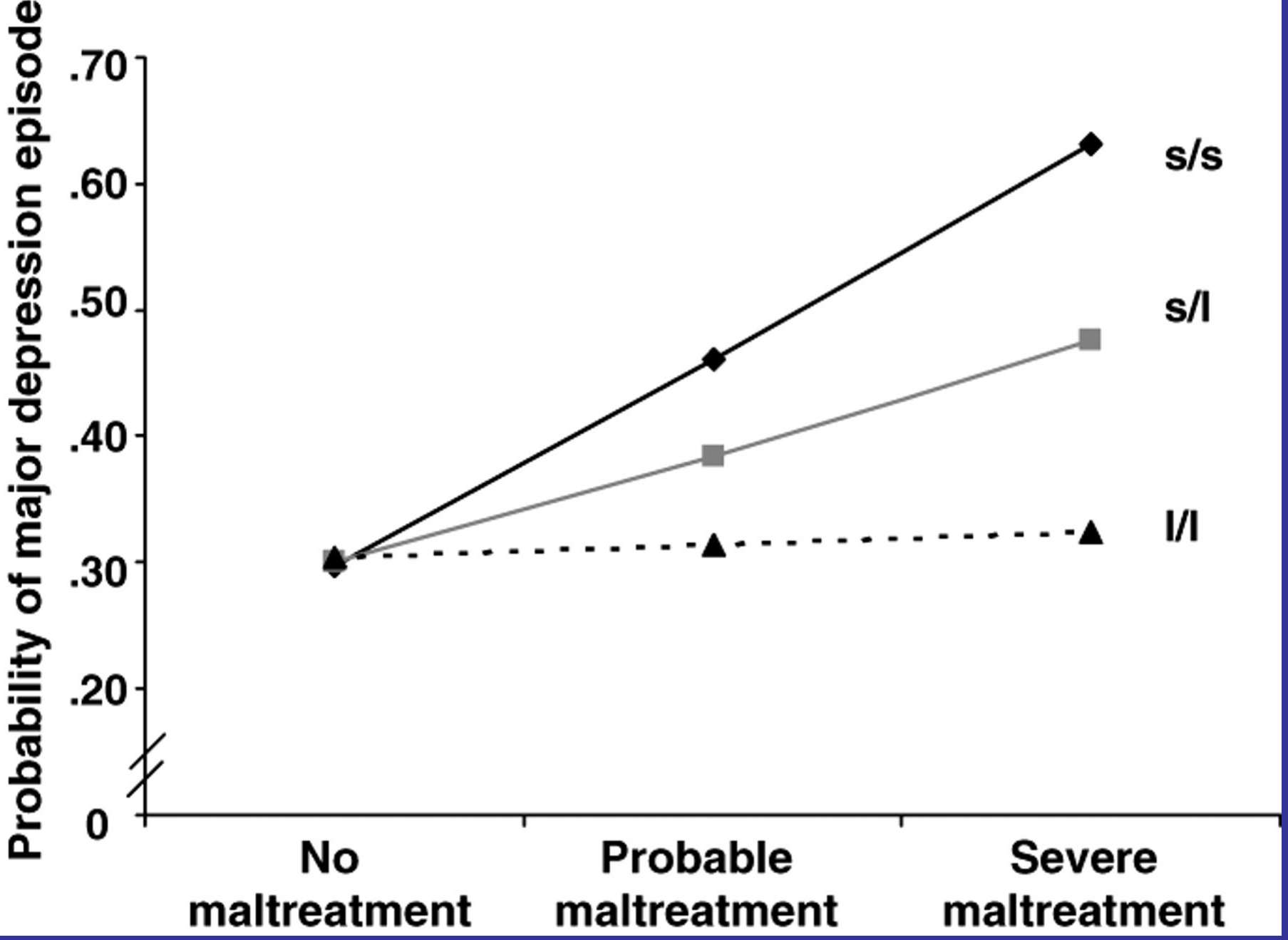
- Resilience is multidimensional
- May be competent during stress and adversity in one domain but not others
  - Academic
  - Physical
  - Social
  - Emotional
  - Interpersonal

NC-PTSD/ Yale Resilience Laboratory Studies

- US Army Survival School
- US Navy Survival Schools
- US Marine Corps Special Operations Command
- Canadian Joint Task Force (Special Operations)
- Norwegian Survival School.

Mediating/Moderating Factors

- Genetic (e.g. serotonin transporter gene)
- Stress management history (e.g. stress inoculation vs stress sensitization)
- Neurobiological (e.g. regulation of stress hormone responsiveness, neurocircuitry, conditionability)
- Psychosocial (e.g. social support)



Caspi A. et al, Science, July 18, 2003, Volume

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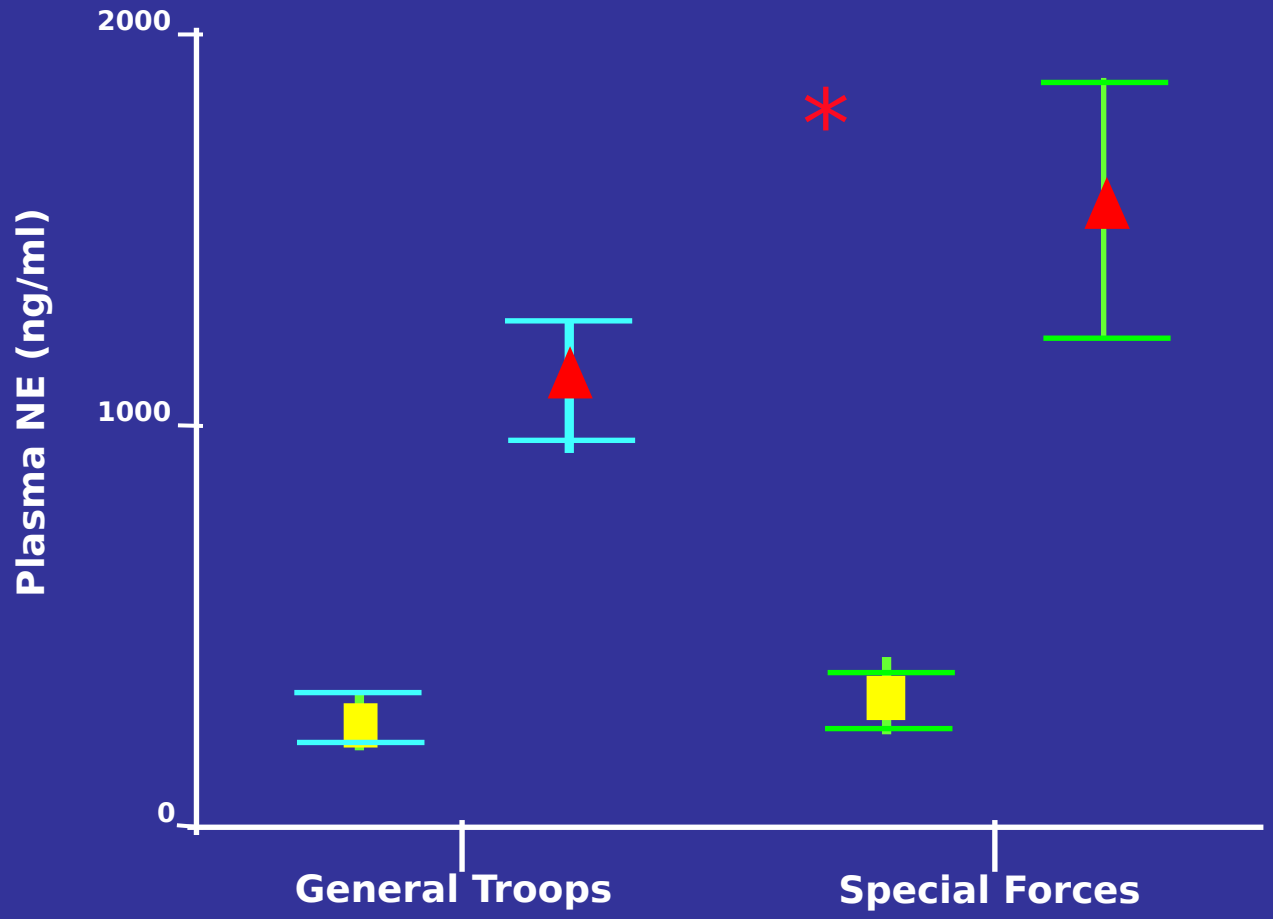
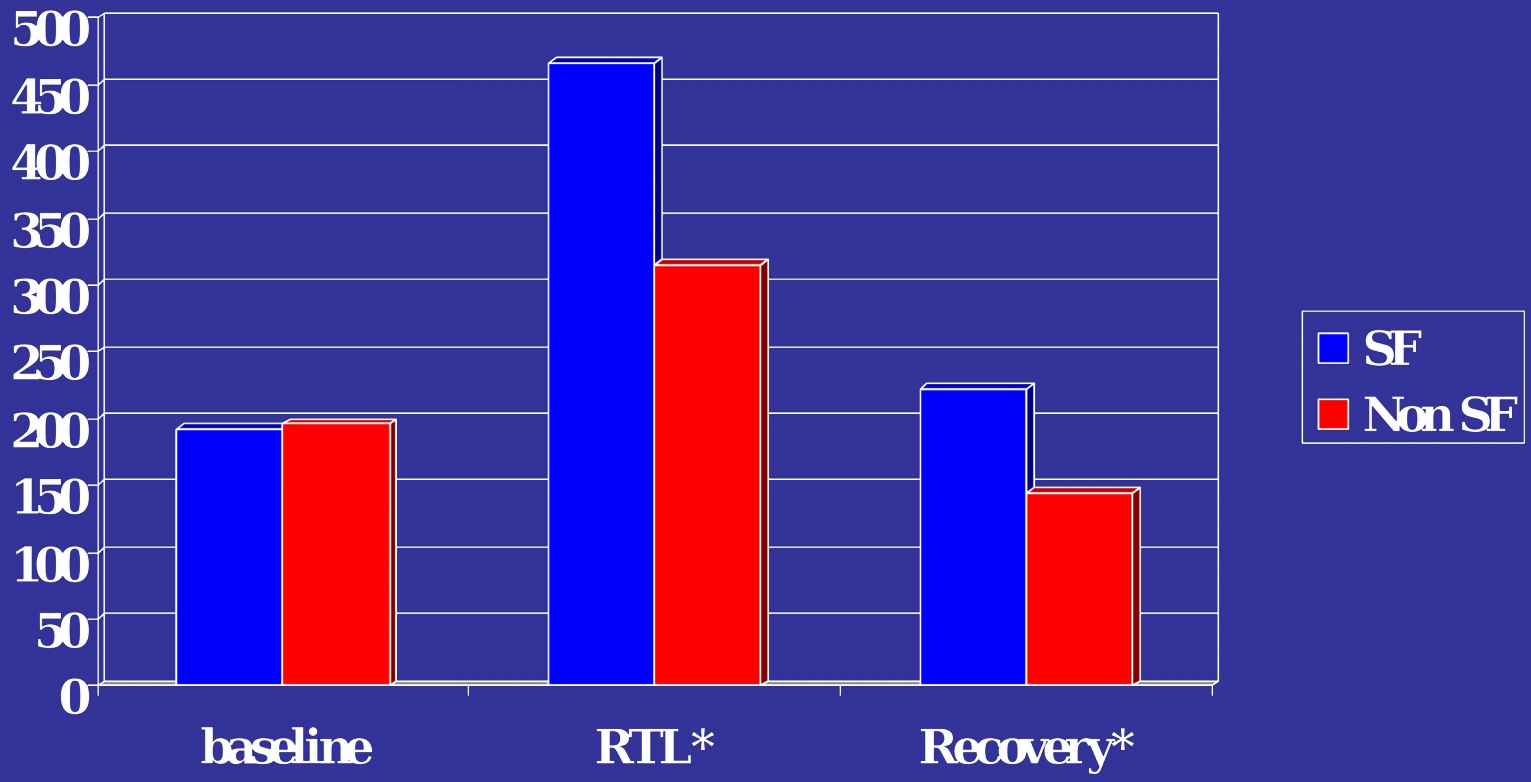
Noradrenaline

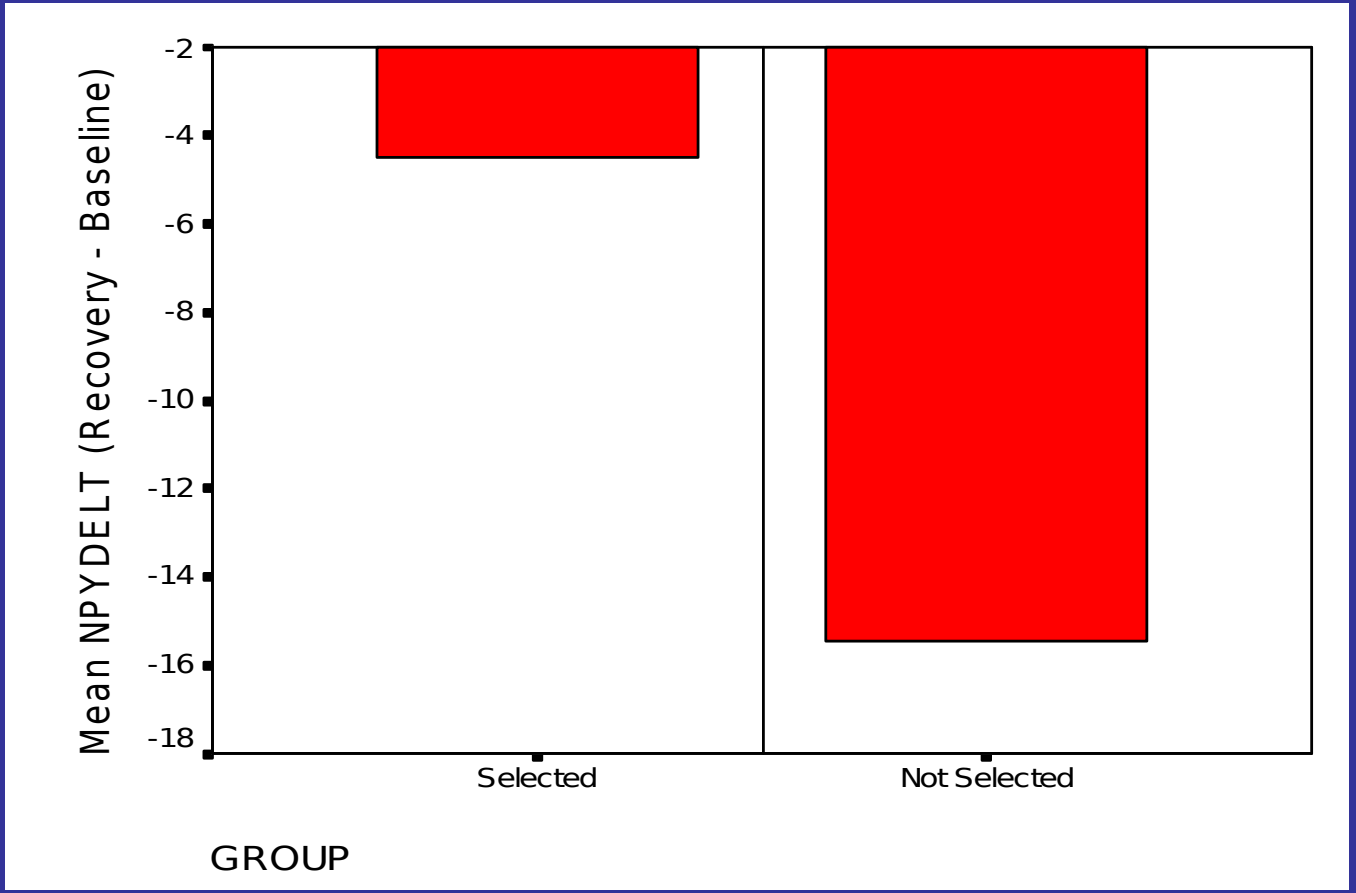


Morgan 2000 and Morgan

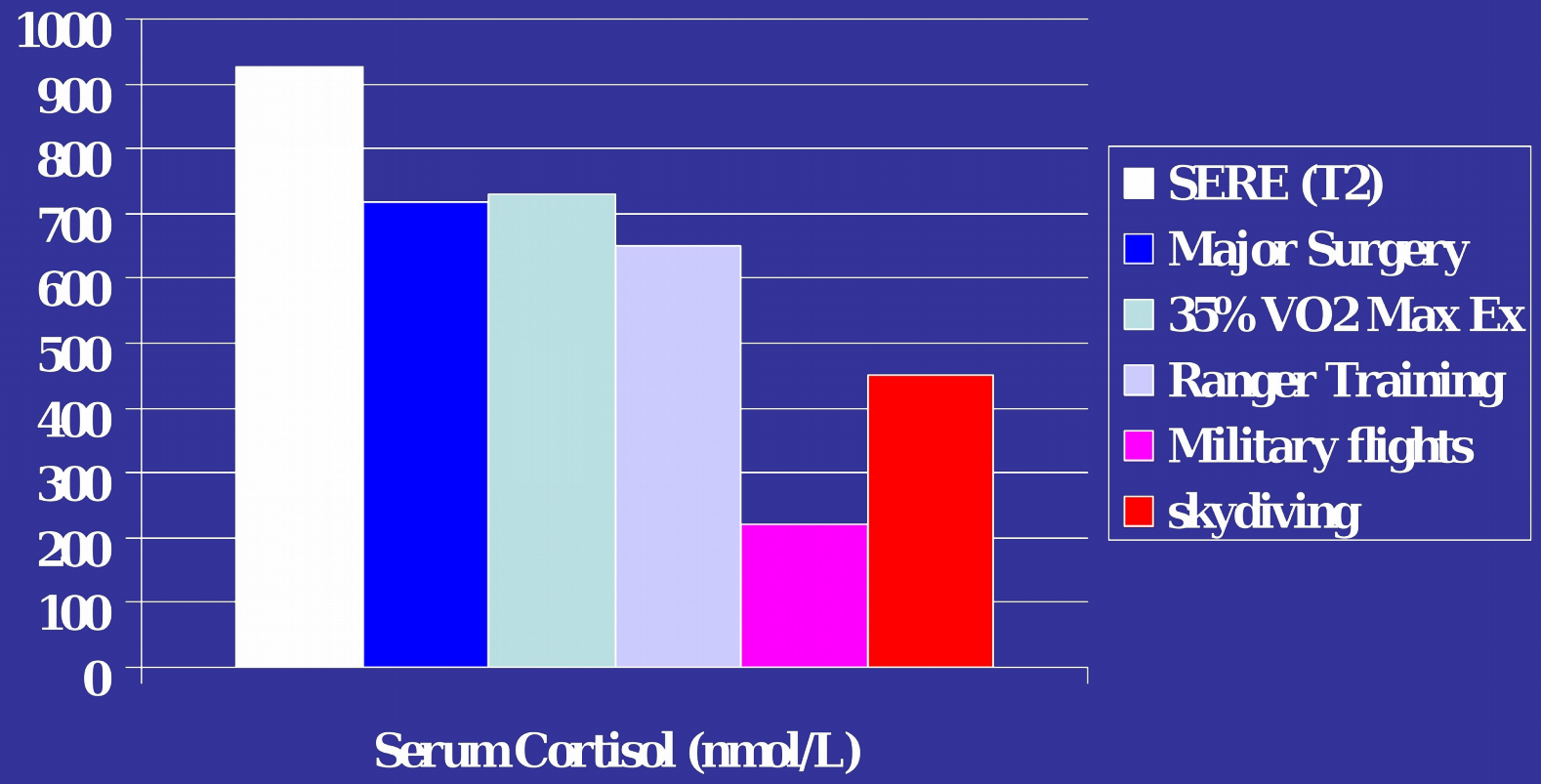
Neuropeptide Y changes. SF group was back to baseline NPY levels post stress but the non SF group was not? Based on this, we predicted what would happen at SFAS (Morgan et al., 2000; 2001)



NPY and Selection Status: Soldiers who return to baseline NPY after stress are more likely to be selected into SF.



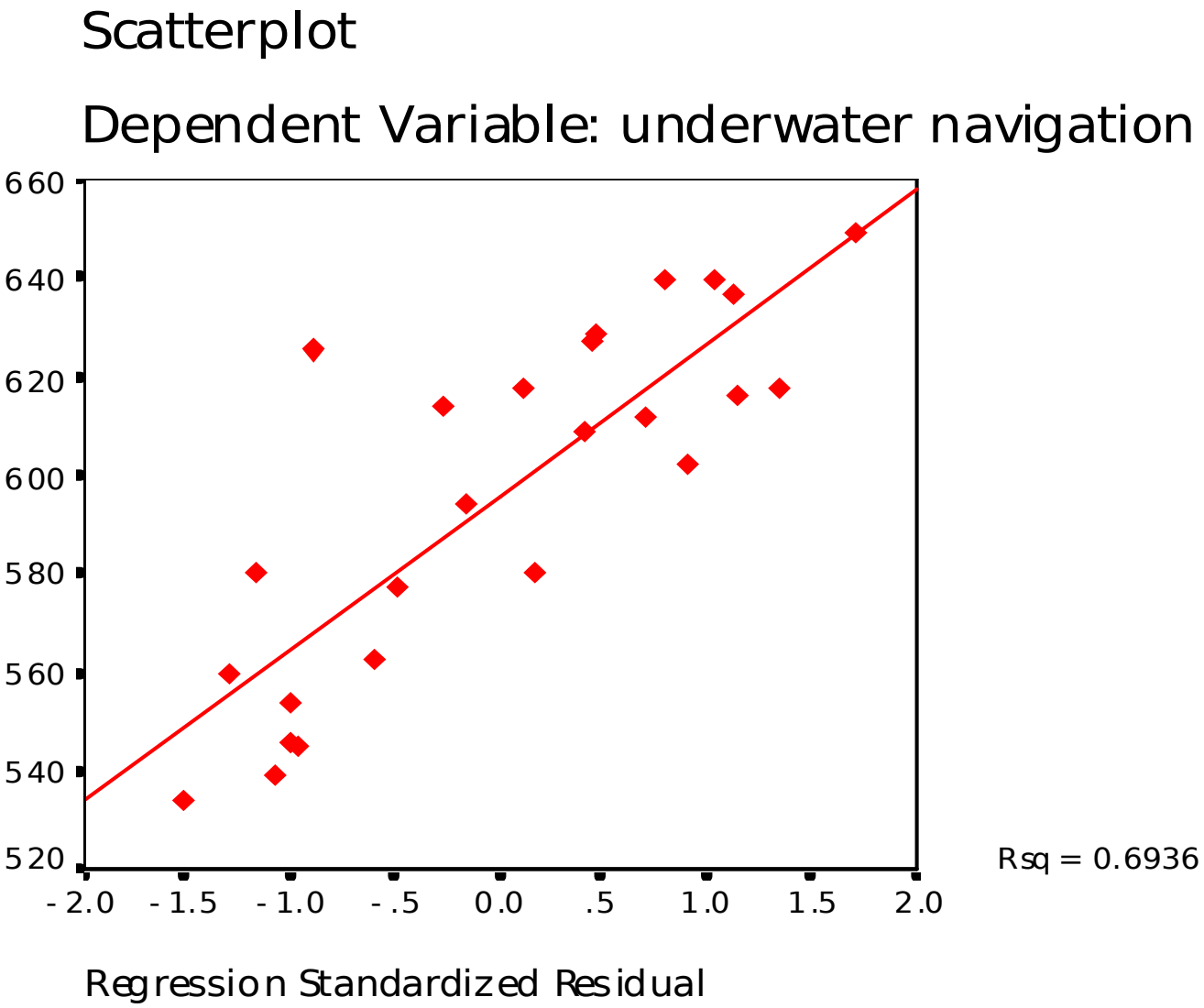
SERE-induced changes of cortisol compared to other types of stress



Underwater Navigation - a human water maze task: ideal for testing objective performance and DHEA

DHEA(S) and Objective Performance During Acute Stress (CDQC)

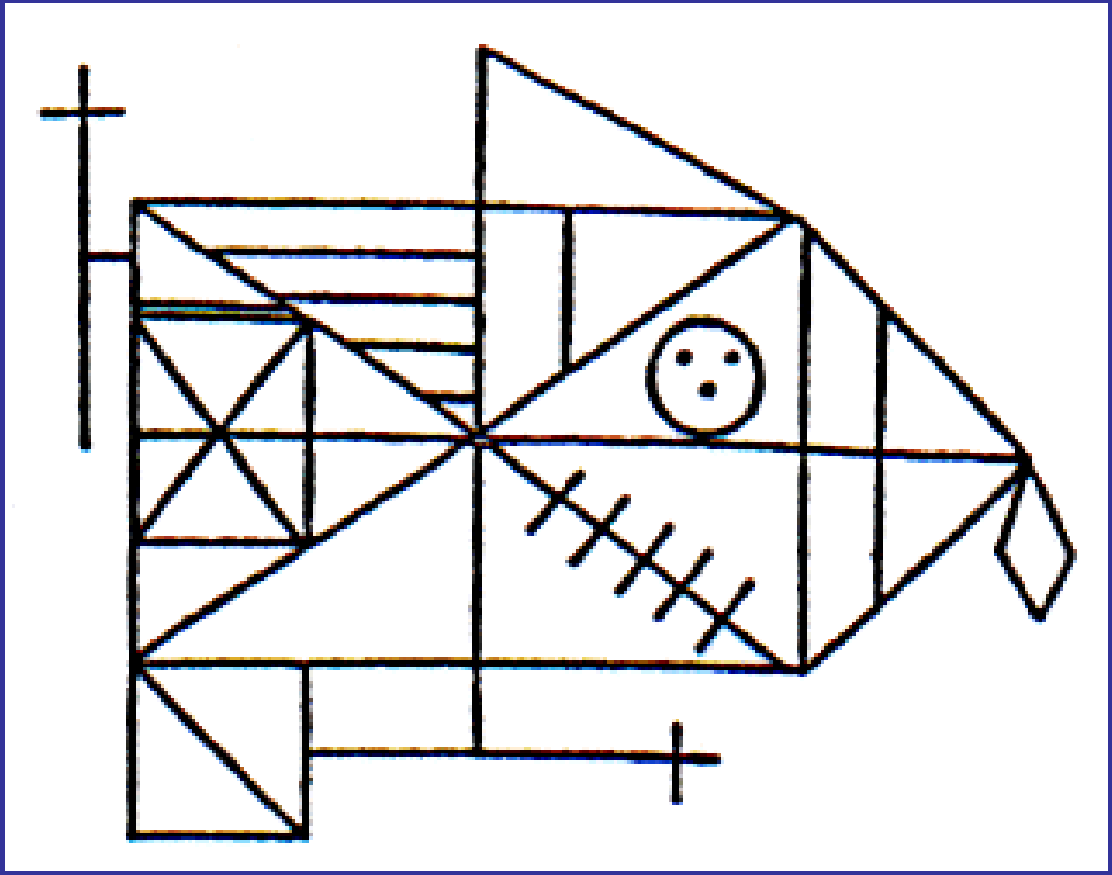
(manuscript submitted)



Summary:

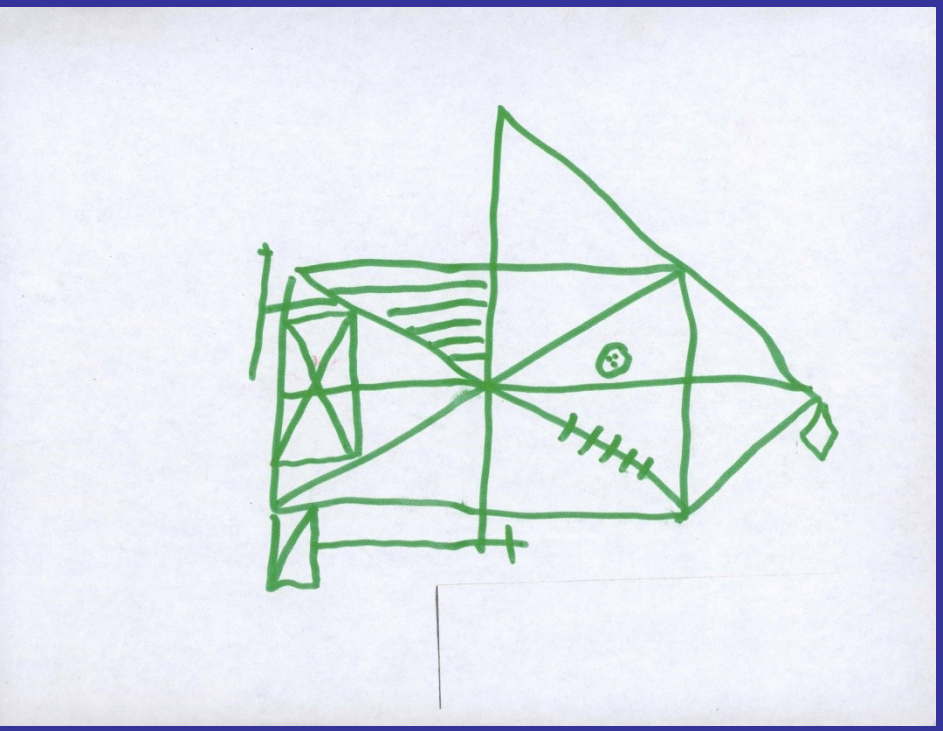
- Superior stress tolerance and performance were associated with increased NPY.
- NPY response to stress associated with likelihood of being selected into SF
- Superior stress tolerance and performance were associated with increased DHEA/cortisol ratio.

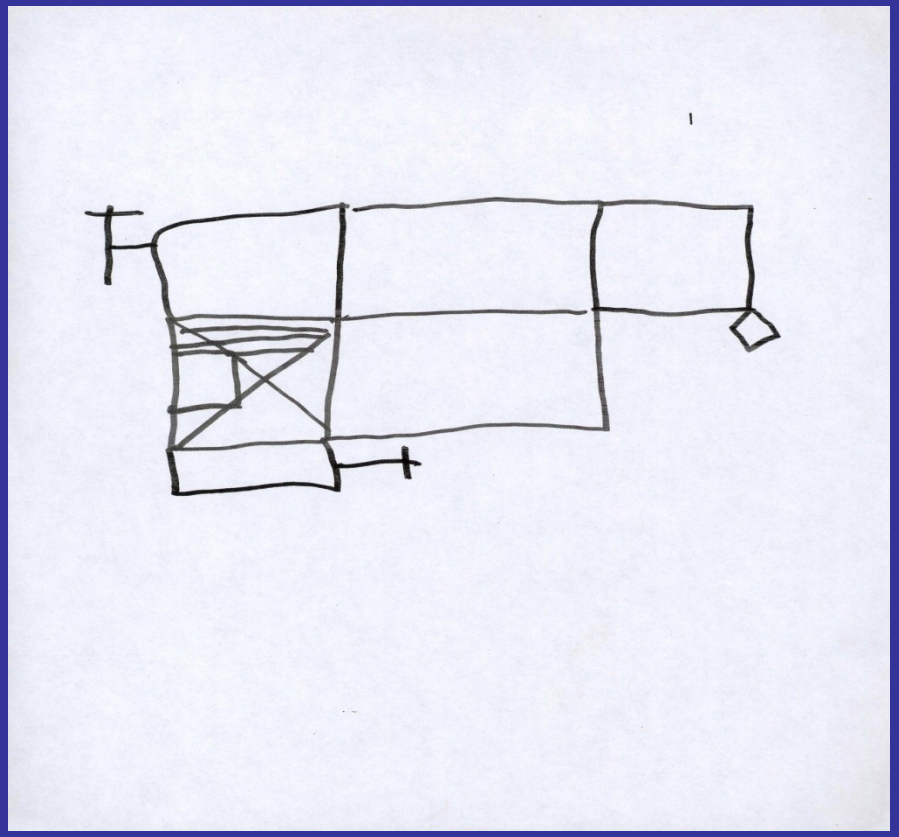
Figures 1: Rey-Osterreith Complex Figure (ROCF)



Impact of Stress on ROCF Recall Performance (Morgan et al., 2006)

The figure on the left shows normal ROCF immediate recall for the ROCF figure under conditions of no stress. The figure on the right shows ROCF immediate recall in subjects exposed to high intensity stress.





Carbohydrate Administration

- Carbohydrate drink vs Placebo drink shortly after high stress SERE training
- Performance on complex cognitive task hours later significantly better in the carbohydrate drink group
- Just as carbohydrates improves physical performance, they also improve cognitive performance

Morgan 2008

Mediating/Moderating Factors

- Genetic (e.g. serotonin transporter gene)
- Developmental (e.g. stress inoculation vs stress sensitization)
- Neurobiological (e.g. regulation of stress hormone responsiveness, neurocircuitry, conditionability)
- Psychosocial (e.g. social support)

Resilience: Psychosocial Factors
NIMH/NCPTSD

- Resilient Role Models
- Positive Emotions (optimism and humor)
- Coping Style (active coping)
- Regulating Emotions (fear, anger, etc)
- Moral code (including altruism)
- Spirituality (including religion)
- Social support (including unit support)
- Cognitive flexibility (positive reappraisal)
- Training (physical, psychological and spiritual)
- Recovery (physical and emotional)
- Purpose and meaning (mission)

Southwick et al 2005

Resilient Role Models

Role Models

- Learning through observation and imitation is very effective
- Imitate attitudes, values, skills, patterns of thought and behavior
- Study the resilient role model
  Analyze behaviors, values and attitudes.
  Then imitate (e.g. Wounded Warrior)

-Bandura

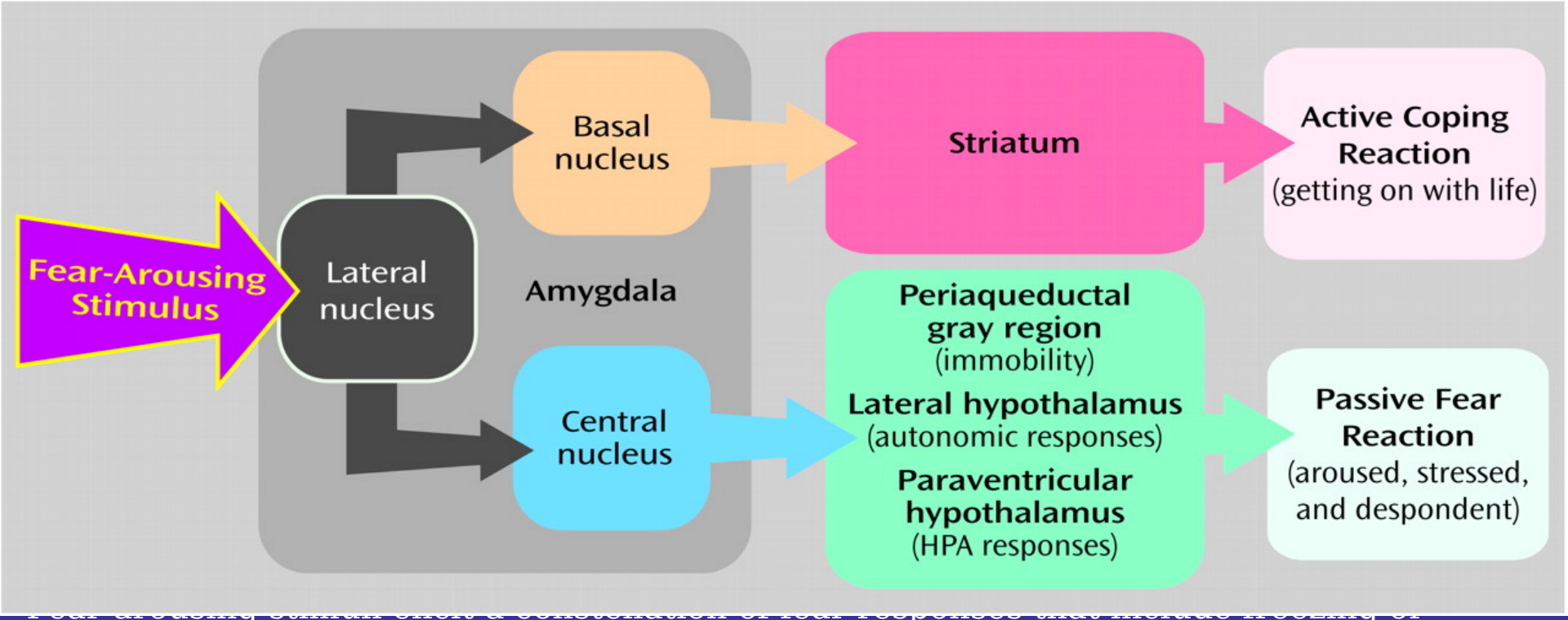
Active Coping vs. Passive/ Avoidance

Active vs Passive

Active	Passive
Gather information	Deny the problem
Acquire skills	Wait for dust to settle
Confrontation	Avoid or withdraw
Problem solving	Substance use
Seek social support	Negative venting
Cognitive reappraisal	Blaming

Active, Approach-Oriented Coping

- Fewer PTSD symptoms in Gulf War veterans (n=2,949)
- Lower levels of distress in ER physicians
- Wounded Warrior Athletic Programs



immobility and activation of autonomic and neuroendocrine responses. These responses can be coupled to otherwise meaningless events through a process of associative learning. Studies of rats over the past 20 years have implicated the amygdala in this process of learning (1, 2). Specifically, the lateral nucleus of the amygdala is where the conditioned stimulus and unconditioned stimulus are integrated. Subsequently, exposure to the fear-arousing conditioned stimulus enters the lateral nucleus, where its meaning is encoded. The lateral nucleus in turn activates the central nucleus of the amygdala, which activates brainstem areas involved in controlling specific components of the fear reaction. Connections with the periaqueductal gray region control the freezing or immobility response, connections with the lateral hypothalamus control autonomic responses, and connections with the paraventricular hypothalamus control endocrine responses of the hypothalamic-pituitary-adrenal (HPA) axis. Animals and people involuntarily (passively) express these responses to fear-arousing stimuli. However, through a process of active responding, the flow of information can be diverted to the basal nucleus of the amygdala

Regulating Emotions: Facing Fear

Facing Fear: Behavior

1. Acquire information about what is feared
2. Learn skills necessary to move through fear
3. Have a plan and back-up plan
4. Practice plan and back-up plan
5. Confront fear with trusted colleagues when possible

Exposure Therapies

- Prolonged Exposure
- Cognitive Processing Therapy
- EMDR
- Mindfulness

Moral Compass

Moral Compass: Epicetus

Look not for any greater harm than this: destroying the trustworthy, self-respecting well-behaved man in you

“You can’t buy it or sell it, When supported with education, a person’s integrity can give him something to rely on when his perspective seems to blur, when rules and principles seem to waver, and when he’s faced with hard choices of right and wrong. It’s something to keep him on the right track, something to keep him afloat when he’s drowning.”

Altruism and Resilience

- Altruism is associated with resilience and positive mental health
- Required helpfulness: WW II
- Reciprocal altruism: Ethology
- Mutual cooperation activates brain regions involved in the processing of reward (i.e. dopamine nucleus acumbens reward system)

-

Rachman

Religion/Spirituality

Religion/Spirituality and Resilience

- Associated with longevity (meta-analysis of 42 studies and 126,000 subjects)
- Fewer hospital days, fewer medical complications and greater subjective assessment of physical well being in rheumatoid arthritis, burns, organ transplants
- Lower levels of depression in numerous medical and non-medical populations
- Use of positive religious coping at time of trauma associated with lower subsequent distress

Religion/ Spirituality

“To guard against such despair, in our most dire moments. POWs would make supreme efforts to grasp our faith tightly, to profess it alone in the dark, and hasten its revival. Once I was thrown into another cell after a long and difficult interrogation. I discovered scratched into one of the cell’s walls the creed, ‘I believe in God, the Father Almighty’”

-John McCain

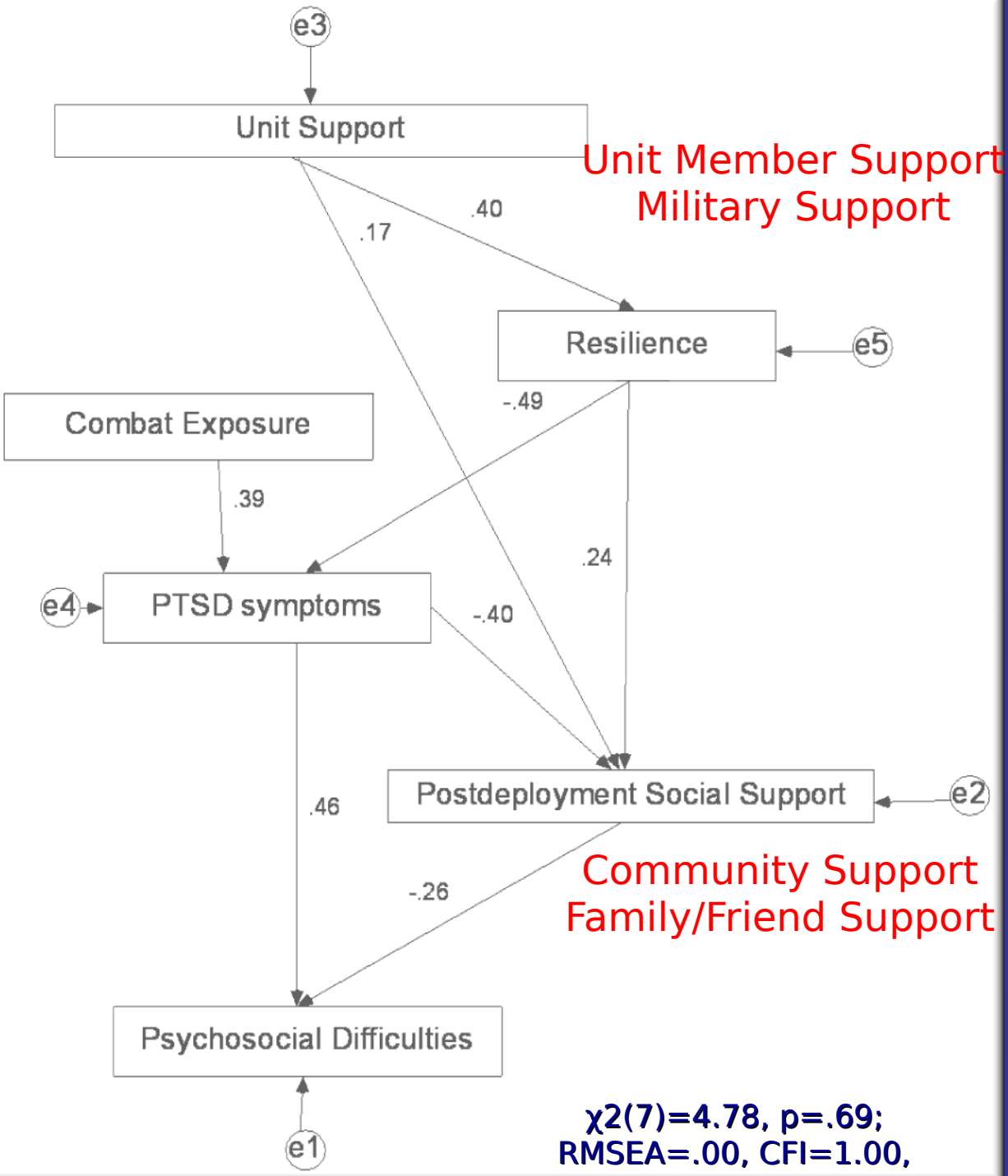
Social Support

Poor Social Support

- Higher rates of PTSD in Vietnam veterans
- Life expectancy: May to be as strongly associated with poor social support as with obesity, cigarette smoking, hypertension or level of physical activity

High Social Support

- Reduced physiological reactivity to stress
- More effective coping strategies (active)
- Increased self-esteem and self-efficacy
- Protection against mental illness


e3
Unit Support
Unit Member Support
Military Support
.40
.17
Resilience
e5
-.49
Combat Exposure
.39
.24
e4
PTSD symptoms
-.40
.46
Postdeployment Social Support
e2
Community Support
Family/Friend Support
-.26
Psychosocial Difficulties
e1
χ2(7)=4.78, p=.69;
RMSEA=.00, CFI=1.00,

Cognitive Flexibility and Posttraumatic Growth

Cognitive Reappraisal

Ability to cognitively appraise, reframe or find positive meaning in adversity (e.g. redefining a crisis as a challenge and opportunity)

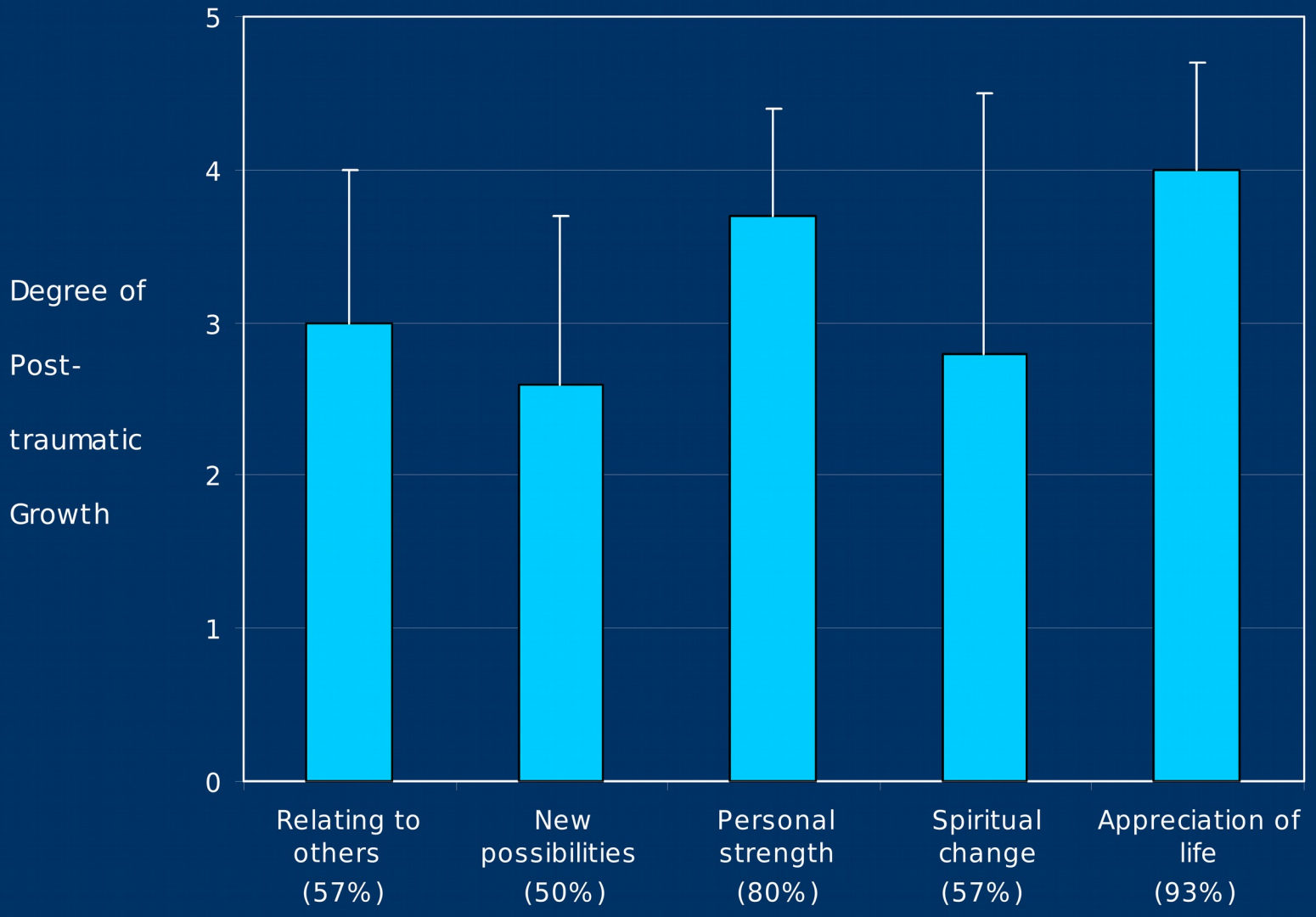
Posttraumatic Growth

Greater appreciation of life
Enhanced wisdom and maturity
Shift in values/ perspectives/ philosophy
New found meaning and purpose
Greater compassion/ acceptance
Closer ties with family and friends
Improve coping skills
Enhanced self-esteem

-Tedeshi

Posttraumatic Growth in Vietnam POWs

(PTGI)



PTGI = Posttraumatic Growth Inventory; mean score range = 0-5
n = 30

Training

Training and Brain plasticity

- The brain is malleable, plastic and responsive
- Experience rewires the brain
- Use it or lose it
- The more a skill is rehearsed the more space and wiring the brain devotes to supporting the new skill (e.g. violin players)

Scenario-based Training

- Effective practice-based training system
- Interaction with ‘real scenarios’ facilitates speed and extent of learning
- Allows for diagnosis of problems, feedback and correction

Stress Inoculation

- To achieve greater tolerance or acclimatization to a physical stressor, a progressively greater exposure is required. The exposure should be sufficient to produce greater than routine stress… You can become aerobically fit only by exerting yourself to progressively greater degrees of physical effort. The process of improving tolerance to stressors through progressive exposure to those stressors will also be true of cognitive-emotional stressors.

  - U.S. Army Training Manual

Recovery

- How rapidly someone recovers from stress is associated with resilience
- This stress can be psychological or physical (e.g. strength training)
-
- Importance of structured and rigorous attention to recovery

Barriers to Care: Ft. Drum

- Army's 10th Mountain Division, 16,000 soldiers
- Most deployed unit in United States Army
- High rate of PDHA positive screens but only 15% of screen positive soldiers request assistance from Behavioral Health

Barriers To Care

- Patient Based Barriers
  - Beliefs about treatment, stigma, effects on career
  - Desire to solve problem on own
- Clinician Based Barriers
  - Limited experience with PTSD
  - Focus on pathology to the exclusion of strength and resilience
- Organization Based Barriers
  - Philosophy (e.g. “warrior ethos”)
  - Insufficient staffing
  - Poorly integrated systems of care

Ft. Drum Outreach and Wellness Program

- *Medical Normalizing Model*: Normal reaction to combat. Emphasis on resilience, skill training, job performance, restoration to optimal heath and functioning rather than psychopathology
- *Leadership support*: Commanding General and 50 Senior Leaders.
- *Task Force* (Leaders, Chaplains, Mental Health Professionals) to implement Commanding General's Directives
- *Augmentation of resources*
- *Education and training of clinicians* (NCPTSD: CPT training)
- *Education of soldiers* (normalization, minimize stigma, optimal functioning, support of leadership)
- *One on one Screening*: PDHA every soldier meets clinician

Results of Wellness Program

- Subjects: Over 900 soldiers returning from deployment in Iraq/Afghanistan
- Increase in screen positive soldiers who requested Behavioral Health Assistance from 15% to 88%.
- Of those who requested help, percent who actually came to a Behavioral Health appointment: 71%

Morrissey

Meaning and Purpose

Meaning, Purpose, and Mission

“Men are strong as long as they stand for an idea.”

Freud

“He who has a why can endure almost any how.”

Kierkegaard

Survivor Mission

“These survivors recognized a political or religious dimension in their misfortune and discover that they can transform the meaning of their personal tragedy by making it a basis for social action. While there is no way to compensate for an atrocity, there is a way to transcend it by making it a gift to others.”

Judith Herman

LANDMINE
SURVIVO
NET

Reebok

General Marc Graham

Resilience

1. Imitate resilient role models
2. Cultivate positive emotions (embrace humor)
3. Solidify moral compass
4. Practice religion/ spirituality
5. Seek/ attract social support

Resilience

7. Foster signature strengths
8. Actively cope with stress
9. Face fears
10. Train in one or more areas (Recovery)
11. Cultivate cognitive flexibility: cognitive reappraisal, acceptance
12. Extract meaning from trauma and from life